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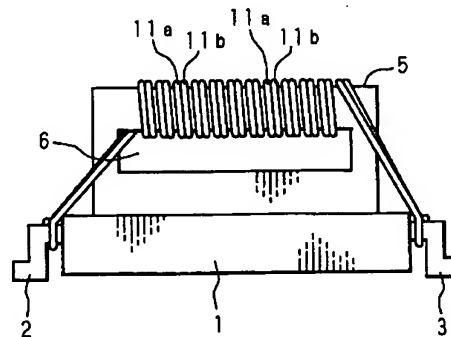
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(54) 【発明の名称】 コモンモードチョークトランス

(57) 【要約】

【課題】 サイズを大きくすることなく浮遊容量を更に低減してより高い高周波特性を有するコモンモードチョークトランスを提供する。

【解決手段】 ベース1には、入側端子2、2及び出側端子3、3が突設してあり、これらの先端部の底面は、ベース1の裏面とそれぞれ略面一にしてある。ベース1の表面中央には口型コア5が、一長辺側の周面をベース1に当接させた状態で固定してあり、口型コア5のベース1に当接していない他長辺側縁部と開口6との間の部分に2本の巻線11a、11bが、口型コア5の長辺の長手方向へ略一定の巻回ピッチで整列巻きしてある。両巻線11a、11bの一端はベース1の一側面に突設した1対の入側端子2、2に各別に巻回固定してあり、両巻線11a、11bの他端はベース1の他側面に突設した1対の出側端子3、3に各別に巻回固定してある。



## 【特許請求の範囲】

【請求項1】 筒状のコアに1次側及び2次側の対をなす巻線が、該コア内を貫通する状態で巻回してあるコモンモードチョークトランスにおいて、前記コアの端縁の前記巻線が巻回してある部分は直線形状を有することを特徴とするコモンモードチョークトランス。

【請求項2】 前記コアは2脚型であり、該コアの一方の脚に対応する部分に一对の巻線が整列巻きしてある請求項1記載のコモンモードチョークトランス。

【請求項3】 前記コアは3脚型であり、該コアの3脚の内の外側の2脚に対応する部分に一对ずつ巻線が整列巻きしてある請求項1記載のコモンモードチョークトランス。

【請求項4】 前記コアは絶縁材料製の基板に、コアの一端が基板に対向し、コアと基板との間に間隙が生じるように支持されている請求項1乃至3の何れかに記載のコモンモードチョークトランス。

【請求項5】 前記コアの巻線が整列巻きしてある脚に対向する基板部分に切り欠きが設けてある請求項4記載のコモンモードチョークトランス。

## 【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、パーソナルコンピュータ及びデジタルビデオカメラ等の電子機器間で信号を伝送する場合に生じるコモンモードノイズを除去するコモンモードチョークトランスに関する。

【0002】

【従来の技術】図12は従来のコモンモードチョークトランスを示す平面図であり、図中、25はドーナツ状のトロイダルコアである。トロイダルコア25には1次側及び2次側の巻線28a、28bが所定のピッチで巻回してあり、該トロイダルコア25は絶縁材料製のベース21にトロイダルコア25の開口26がベース21に対向する状態で固着してある。ベース21には4つの端子22、22、23、23が取り付けられてあり、各端子22、22、23、23に両巻線28a、28bの両端が各別に接続してある。

【0003】このようなコモンモードチョークトランスでは、トロイダルコア25並びに該トロイダルコア25に巻回した1次側及び2次側の巻線28a、28bによって1つのトランスが構成される。この1次側及び2次側の巻線28a、28bの電磁的な結合は密であり高結合となっているため、信号線と大地アースとの間を流れるノイズ電流であるコモンモードノイズに対してはコイルとして機能するのでインピーダンスが高く、信号線間に流れるノーマルモードの電流にはコイルとしてほとんど機能しないのでインピーダンスが低い。従って、1次側の巻線28a及び2次側の巻線28bを入出力とする1チャンネルの回路について、コモンモードノイズを効率的に除去することができる。

【0004】一方、IEEE1394に対応するインタ

ーフェイスモジュールには、信号を差動伝送すべく2チャンネルの回路が設けてある。このような2チャンネルの回路に生じるコモンモードノイズを除去するために、特開平11-135330号公報には次のようなコモンモードチョークトランスが開示されている。

【0005】図13及び図14は、特開平11-135330号公報に開示されたコモンモードチョークトランスの正面図及び平面図であり、図中、31は絶縁材料を長方形にしたベースである。ベース31の長辺側の両側面にはそれぞれ4つずつ、計8つの矩形の端子32、32、32、32、33、33、33、33が長辺の長手方向へ所定の間隔を隔てて突設してあり、各端子32、32、32、32、33、33、33、33は、先端部がベース31の裏面と面一になるように階段状に折り曲げてある。

【0006】ベース31の表面中央には、長円柱の両極近傍に円柱状の貫通孔38、38をそれぞれ開設したメガネ型コア37が、該メガネ型コア37の周面平坦部をベース31に当接させた状態でベース31に固定してある。メガネ型コア37の一極部と一方の貫通孔38との間の部分に、1次及び2次の一对の第1巻線41a、41bが所定のターン数になるように整列巻きしてあり、これによって第1のトランスが形成してある。両第1巻線41a、41bの入側端はベース31の側面に突設した一对の端子32、32に巻回させてあり、両第1巻線41a、41bの出側端はベース31の他側面に突設した一对の端子33、33に巻回させてある。

【0007】また、メガネ型コア37の他極部と他方の貫通孔38との間の部分に、1次及び2次の他対の第2巻線42a、42bが所定のターン数になるように整列巻きしてあり、これによって第2のトランスが形成してある。両第2巻線42a、42bの入側端はベース31の側面に突設した他対の端子32、32に巻回させてあり、両第2巻線42a、42bの出側端はベース31の他側面に突設した他対の端子33、33に巻回させてある。

【0008】このようなコモンモードチョークトランスでは、前述した第1のトランス及び第2のトランスによって、2チャンネルの回路にそれぞれ生じるコモンモードノイズを各別に除去することができる。

【0009】

【発明が解決しようとする課題】ところで、これらのコモンモードチョークトランスには、それを搭載させる電子機器のクロック周波数が高くなるに従って、より高周波特性に優れたものが要求されている。しかし、従来の何れのコモンモードチョークトランスでも、一对の巻線のコアへの巻き始めの位置と巻き終わりの位置とが比較的近いため、浮遊容量が大きく、高周波特性を向上させるには限界があった。また、巻線のコアへの巻回ピッチは、コアの外周縁から内周縁に向かうにつれて小さくなっており、巻線のコアの内周縁側の部分ほど浮遊容量が大きいことも、高周波特性の向上を妨げる一因となっている。

【0010】本発明はかかる事情に鑑みてなされたものであって、その目的とするところは筒状のコアの端縁が直線形状の部分に対をなす巻線を巻回した構成にすることによって、サイズを大きくすることなく浮遊容量を更に低減してより高い高周波特性を有するコモンモードチョークトランスを提供することにある。

【0011】

【課題を解決するための手段】第1発明に係るコモンモードチョークトランスは、筒状のコアに1次側及び2次側の対をなす巻線が、該コア内を貫通する状態で巻回してあるコモンモードチョークトランスにおいて、前記コアの端縁の前記巻線が巻回してある部分は直線形状を有することを特徴とする。

【0012】第2発明に係るコモンモードチョークトランスは、第1発明において、前記コアは2脚型であり、該コアの一方の脚に対応する部分に一对の巻線が整列巻きしてあることを特徴とする。

【0013】第3発明に係るコモンモードチョークトランスは、第1発明において、前記コアは3脚型であり、該コアの3脚の内の外側の2脚に対応する部分に一对ずつ巻線が整列巻きしてあることを特徴とする。

【0014】直線形状の部分有する筒状のコアが設けられている。このようなコアとして、2脚型のコア又は3脚型のコアがある。これらのコアの直線形状の部分に1次側及び2次側の一对の巻線が整列巻きしてある。即ち、2脚型のコアでは、該コアの一脚に一对の巻線を整列巻きしてあり、両巻線によって1チャンネルの回路に生じるコモンモードノイズを除去する。また、3脚型のコアでは、3脚の内の外側の2脚に一对ずつ巻線が整列巻きしてあり、二対の巻線によって2チャンネルの回路に生じるコモンモードノイズを各別に除去する。

【0015】このように、コアの直線形状の部分に対をなす巻線が整列巻きしてあるため、コアへの巻線の巻き始めの位置と巻き終わりの位置とは互いに離れており、また、巻線のコアへの巻回ピッチを、巻線の全巻回領域にわたって略一定にすることができる。これによって、浮遊容量が低減されるので、コモンモードチョークトランスの高周波特性は高い。

【0016】第4発明に係るコモンモードチョークトランスは、第1乃至第3発明の何れかにおいて、前記コアは絶縁材料製の基板に、コアの一端が基板に対向し、コアと基板との間に間隙が生じるように支持されていることを特徴とする。

【0017】コアは一端が基板（ベース）に対向するように配置してある。そして、コア内を貫通するように巻回する巻線のスペースを確保するため、例えば、基板又はコアに凸部を設けることによって、コアと基板との間に間隙が設けられている。これによって、巻線と基板との接触を避けて安定したコア-基板間の接着が可能となる。更に、コモンモードチョークトランスの背高を可及的に

低くすることもできる。また、コアを基板に支持した状態で巻線をコアに巻回することもできるため、巻線を巻回していないコアを先に基板に固定することができる。これによって、コアの基板への固定作業を容易に行うことができる。また、コアを基板に支持した状態で巻線をコアに巻回した場合、巻線の両端の固定作業が容易であるため、該作業を迅速に行うことができる。

【0018】第5発明に係るコモンモードチョークトランスは、第4発明において、前記コアの巻線が整列巻きしてある脚に対向する基板部分に切り欠きが設けられていることを特徴とする。

【0019】基板の適宜部分に切り欠きが設けられているため、コアを基板に固定した後に、巻線をコアの脚に整列巻きする作業を、基板に邪魔されることなく容易に行うことができる。

【0020】

【発明の実施の形態】以下、本発明の実施の形態を図面に基いて具体的に説明する。

（実施の形態1）図1、図2及び図3は、本発明に係るコモンモードチョークトランスを示す正面図、平面図及び側面図であり、図4は図1～図3に示したコモンモードチョークトランスの等価回路図である。絶縁材料を正形状に成形してなるベース1の一側面には、クランク形状の2つの入側端子2、2が突設してあり、ベース1の前記一側面と平行な他側面には、クランク形状の2つの出側端子3、3が突設してある。これら入側端子2、2及び出側端子3、3の先端部の底面は、ベース1の裏面とそれぞれ略同一にしてある。

【0021】ベース1の表面中央には、例えばNiZn系の軟磁性材料を直方筒状に成形した2脚の□型コア5が、一長辺側の周面をベース1に当接させた状態で固定してある。□型コア5のベース1に当接していない他長辺側縁部と開口6との間の部分に2本の巻線11a、11bが、□型コア5の長辺の長手方向へ略一定の巻回ピッチで整列巻きしてある。両巻線11a、11bの一端はベース1の一側面に突設した1対の入側端子2、2に各別に巻回固定してあり、両巻線11a、11bの他端はベース1の他側面に突設した1対の出側端子3、3に各別に巻回固定してある。これによって、図4に示した如く、入側端子2、2と出側端子3、3との間にトランスTが形成される。

【0022】このようなコモンモードチョークトランスでは、トランスTによって1チャンネルの回路に生じるコモンモードノイズを除去する。このとき、両巻線11a、11bは□型コア5に前述した如く巻回してあるため、開口6の長寸法と略同じ直径のトロイダルコアに2本の巻線を整列巻きした場合に比べて、コアへの両巻線の巻き始めの位置と巻き終わりの位置とは互いに離れている。また、両巻線11a、11bの□型コア5への巻回ピッチは、□型コア5の長辺の長手方向の全領域にわたって

て略一定である。これによって、浮遊容量が低減されるので、コモンモードチョークトランスの高周波特性を向上させることができる。

【0023】(実施の形態2) 図5、図6及び図7は実施の形態2に係るコモンモードチョークトランスを示す正面図、平面図及び側面図であり、2チャンネルの回路に対応し得るようになってある。また、図8は図5～図7に示したコモンモードチョークトランスの等価回路図である。長方形のベース1上には、低背直方体に、高さ方向へ貫通し、平面視が長方形の2つの貫通孔8、8が長辺と平行に開設してある3脚の日型コア7が配置してある。ベース1の日型コア7の短辺部分に対向する部分には、適宜高さの複数の凸部4、4、…が適宜の間隔で設けてあり、該凸部4、4、…によって日型コア7がベース1から適宜の距離を隔てて支持されている。

【0024】ベース1の短辺側の側面にはクランク形状の4本の入側端子2、2、2、2が突設してあり、ベース1の短辺側の他側面にはクランク形状の4本の出側端子3、3、3、3が突設してある。これら入側端子2、2、2、2及び出側端子3、3、3、3の先端部分の底面は、ベース1の裏面と略面一にしてある。

【0025】日型コア7の貫通孔8、8と長辺側縁部との間の部分(外側の脚)には、2対の巻線11a、11b、12a、12bが、日型コア7の長辺の長手方向へ略一定の巻回ピッチで整列巻きしてある。一対の巻線11a、11bの一端は、一対の入側端子2、2に各別に巻回固定してあり、両巻線11a、11bの他端は、一対の出側端子3、3に各別に巻回固定してある。また、他対の巻線12a、12bの一端は、他対の入側端子2、2に各別に巻回固定してあり、両巻線12a、12bの他端は、他対の出側端子3、3に各別に巻回固定してある。これによって、図8に示した如く、一対の入側端子2、2と出側端子3、3との間にトランスT<sub>1</sub>が形成され、他対の入側端子2、2と出側端子3、3との間にトランスT<sub>2</sub>が形成される。

【0026】このようなコモンモードチョークトランスでは、トランスT<sub>1</sub>、T<sub>2</sub>によって2チャンネルの回路に生じるコモンモードノイズを除去する。このとき、2対の巻線11a、11b、12a、12bは日型コア7に前述した如く巻回してあるため、日型コア7の外法と略同じ外法のメガネ型コアに2対の巻線を整列巻きした場合に比べて、コアへの両対の巻線の巻き始めの位置と巻き終わりの位置とは互いに離れている。また、両対の巻線11a、11b、12a、12bの日型コア7への巻回ピッチは、日型コア7の長辺の長手方向の全領域にわたって略一定である。これによって、浮遊容量が低減されるので、コモンモードチョークトランスの高周波特性を向上させることができる。

【0027】なお、本実施の形態では、複数の凸部4、4、…によって日型コア7を支持してあるが、本発明は

これに限らず、短辺側のベース1に対向する部分に、適宜高さの複数の脚部を設けた日型コアを用いてもよいことはいうまでもない。

【0028】なお、実施の形態1では、口型コア5の一長辺側周面をベース1に当接させた状態で口型コア5をベース1に固定してあるが、本発明はこれに限らず、口型コア5の開口6がベース1に対向するように配置してもよい。この場合、ベース1に凸部を設けておくことによって、又は口型コア5の開口端部に脚部を設けておくことによって、口型コア5とベース1との間に所要の間隙を設ける。

【0029】(実施の形態3) 図9は実施の形態3に係るコモンモードチョークトランスを示す斜視図であり、図10は図9に示したベース1の斜視図である。本実施の形態では、ベース1の形状が異なる以外は、実施の形態2に示したコモンモードチョークトランスと実質的に同じ構成であり、図9及び図10中、図5～図7に示した部分に対応する部分には同じ番号を付してその説明を省略する。

【0030】ベース1は、長方形板の長手方向への中心線上に、日型コア7の中央脚の幅と略同じ幅の第1凸部17が設けてあり、長辺側の両縁部中央に第1凸部17に達する矩形の切り欠き16、16をそれぞれ設けることによって4つの角部15、15、15、15が形成してある。これら4つの角部15、15、15、15の内の一方の対角線上に位置する2つの角部15、15の隅に、前記第1凸部17と同じ高さの第2凸部18、18がそれぞれ設けてある。

【0031】このようなコモンモードチョークトランスにあっては、日型コア7の中央脚とベース1の第1凸部17とを接着固定すると共に、日型コア7の4隅の内の2つとベース1の第2凸部18、18とをそれぞれ接着固定した後、日型コア7の外側の脚に、2対の巻線11a、11b、12a、12bをそれぞれ整列巻きする。このとき、前述した如くベース1に切り欠き16、16が設けてあるため、巻線11a、11b、12a、12bの日型コア7への巻回作業を、ベース1に遮られることなく容易に行うことができ、巻回作業効率が高い。また、巻線11a、11b、12a、12bが巻回していない日型コア7をベース1に接着固定するため、該固定作業も容易に行うことができる。

【0032】更に、第2凸部18が設けてある角部15にあっては、該角部15、第2凸部18、日型コア7、及び第1凸部17で囲まれるトンネル状の部分内に巻線の端部を挿通させなければならないが、4つの角部15、15、15、15の内の他方の対角線上に位置する2つの角部15、15には第2凸部18、18が設けられていないため、前述したトンネル状の部分が存在せず、巻線を挿通させる作業が回避される。そのため、巻線11a、11b、12a、12bを入側端子2、2又は出側端子3、3へ巻回固定する作業を容易に行うことができる。

【0033】なお、本実施の形態では、ベース1の2つ

の角部15、15に第2凸部18、18が設けてある場合について示したが、本発明はこれに限らず、何れの角部15、15、15、15にも第2凸部を設けていないベース1を用いてもよいことはいうまでもない。

【0034】また、本実施の形態では、日型コア7を用いた場合について示してあるが、本発明はこれに限らず、口型コア5を用いてもよい。この場合、口型コア5の開口6がベース1に対向するように配置し、ベース1に凸部を設けておくことによって、又は口型コア5の開口端部に脚部を設けておくことによって、口型コア5とベース1との間に所要の間隙が形成されるように口型コア5をベース1に固定する一方、ベース1の、口型コア5の一方の脚に対向する部分に切り欠きを設けておく。これによって、前同様、口型コア5をベース1に固定した後、口型コア5の一方の脚に巻線11a、11bを容易に巻回することができる。

【0035】

【実施例】次に比較試験を行った結果について説明する。図11は比較試験を行った結果を示すグラフであり、縦軸はインピーダンスを、横軸は周波数をそれぞれ示している。また、実線は実施の形態2に係るコモンモードチョークトランスの周波数特性を示しており、●印は図13及び図14に示したメガネ型コアを用いた従来のコモンモードチョークトランスの周波数特性を示している。なお、両コモンモードチョークトランスのコアの外形は同じである。図11から明らかな如く、本発明に係るコモンモードチョークトランスは従来のコモンモードチョークトランスに比べて、試験した周波数の全領域においてインピーダンスが高く、インピーダンスのピーク周波数も高かった。

【0036】

【発明の効果】以上詳述した如く、第1、第2及び第3発明に係るコモンモードチョークトランスにあっては、コアへの巻線の巻き始めの位置と巻き終わりの位置とは互いに離れており、また、巻線のコアへの巻回ピッチを、巻線の全巻回領域にわたって略一定にすることができるため、浮遊容量が小さく、コモンモードチョークトランスの高周波特性が高い。

【0037】第4発明に係るコモンモードチョークトランスにあっては、巻線と基板との接触を避けて安定したコア-基板間の接着が可能となる。更に、コモンモードチョークトランスの背高を可及的に低くすることもでき、また、コアの基板への固定作業を容易に行うことができると共に、巻線の両端の固定作業が容易であるため、該作業を迅速に行うことができる。

【0038】第5発明に係るコモンモードチョークトランスにあっては、コアを基板に固定した後、巻線をコ

アの脚に整列巻きする作業を、基板に遮られることなく容易に行うことができる等、本発明は優れた効果を奏する。

【図面の簡単な説明】

【図1】本発明に係るコモンモードチョークトランスを示す正面図である。

【図2】本発明に係るコモンモードチョークトランスを示す平面図である。

【図3】本発明に係るコモンモードチョークトランスを示す側面図である。

【図4】図1～図3に示したコモンモードチョークトランスの等価回路図である。

【図5】実施の形態2に係るコモンモードチョークトランスを示す正面図である。

【図6】実施の形態2に係るコモンモードチョークトランスを示す平面図である。

【図7】実施の形態2に係るコモンモードチョークトランスを示す側面図である。

【図8】図5～図7に示したコモンモードチョークトランスの等価回路図である。

【図9】実施の形態3に係るコモンモードチョークトランスを示す斜視図である。

【図10】図9に示したベースの斜視図である。

【図11】比較試験を行った結果を示すグラフである。

【図12】従来のコモンモードチョークトランスを示す平面図である。

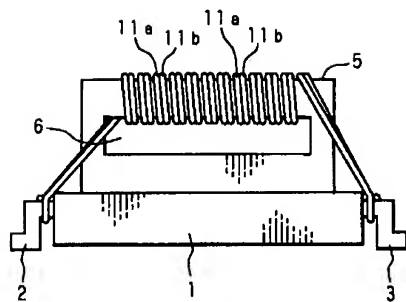
【図13】特開平11-135330号公報に開示されたコモンモードチョークトランスの正面図である。

【図14】特開平11-135330号公報に開示されたコモンモードチョークトランスの平面図である。

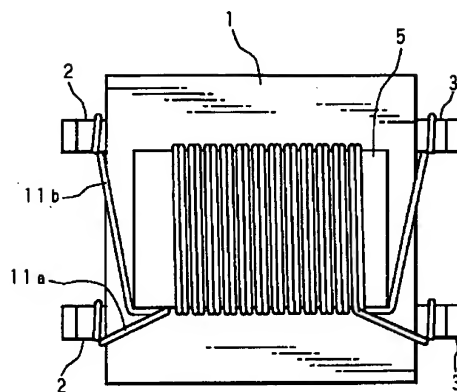
【符号の説明】

1 ベース  
2 入側端子  
3 出側端子  
4 凸部  
5 口型コア  
6 開口  
7 日型コア  
8 貫通孔  
11a 巻線  
11b 巻線  
12a 巻線  
12b 巻線  
16 切り欠き  
17 第1凸部  
18 第2凸部  
T トランス

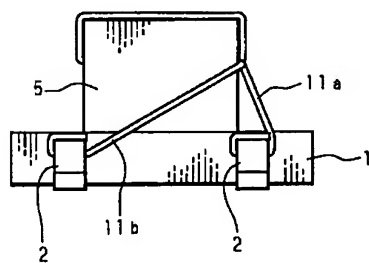
【図1】



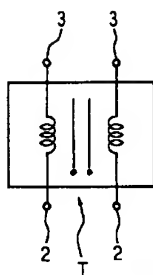
【図2】



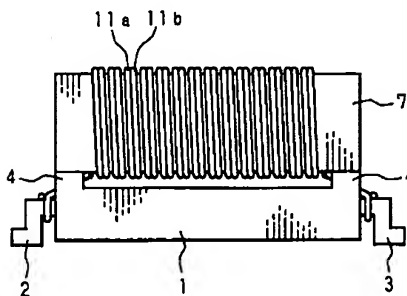
【図3】



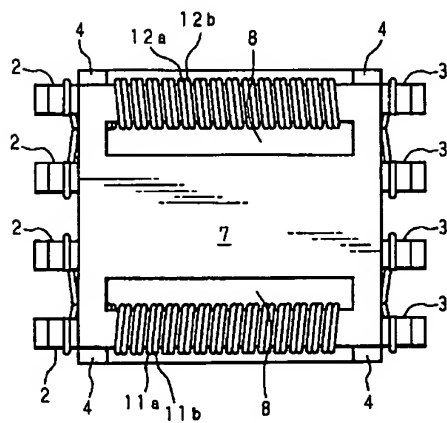
【図4】



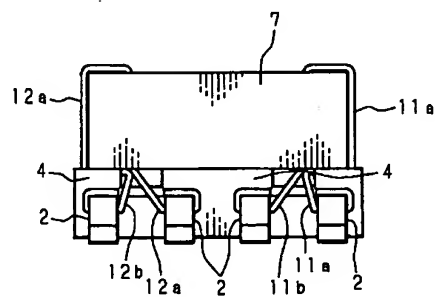
【図5】



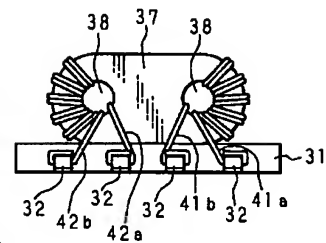
【図6】



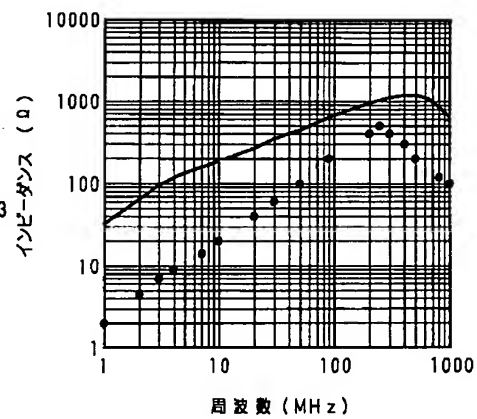
【図7】



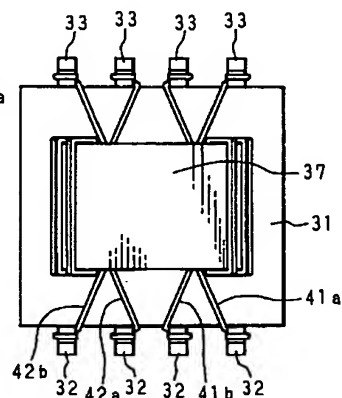
【图 13】



【图 11】



【圖 14】



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**Bibliography**

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- (43) [Date of Publication] August 17, Heisei 13 (2001. 8.17)
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- (51) [The 7th edition of International Patent Classification]  
H01F 17/04

37/00

[FI]

H01F 17/04      A

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37/00      A

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N



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(33) [Country Declaring Priority] Japan (JP)

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[Patent Attorney]

[Name] Kono \*\*\*\*

[Theme code (reference)]

5E070

[F term (reference)]

5E070 AA01 AB01 AB07 BA08 BA14 CA13 DB06

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**Epitome**

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(57) [Abstract]

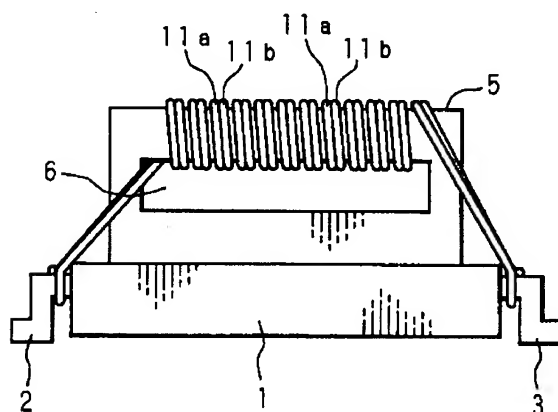
[Technical problem] The common mode choke transformer which reduces stray capacity further and has a higher high frequency property is offered without enlarging size.

[Means for Solution] The close side edge children 2 and 2 and the appearance side edge children 3 and 3 have protruded on the base 1, and the base of these points is used as the rear face of the base 1 at abbreviation flush, respectively. Have fixed the neck ring core 5 in the center of a front face of the base 1 with the aspect which made the peripheral surface by the side of the merits side contact the base 1, and it is not in contact with the base 1 of the neck ring core 5, and also they are two coil 11a and 11b to the part between the long side side edge section and opening 6. The alignment volume has been carried out in the winding pitch of abbreviation regularity to the longitudinal direction of the long side of the neck ring core 5. Both coil 11a and 11b Winding immobilization has been carried

out at each \*\* at one pair of close side edge children 2 and 2 who protruded on one side face of the base 1, and an end is both coil 11a and 11b. Winding immobilization of the other end has been carried out at each \*\* at one pair of appearance side edge children 3 and 3 who protruded on the other side faces of the base 1.

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[Translation done.]



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CLAIMS

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[Claim(s)]

[Claim 1] The part around which said coil of the edge of said core is wound in the common mode choke transformer by which the coil which makes the pair of a primary side and a secondary is wound around the tubed core with the aspect which penetrates this incore one is a common mode choke transformer characterized by having a straight-line configuration.

[Claim 2] Said core is a common mode choke transformer according to claim 1 by which it is a 2-piece mold and the alignment volume of the coil of a pair has been carried out to the part corresponding to one foot of this core.

[Claim 3] Said core is a common mode choke transformer according to claim 1 by which it is a 3-piece mold and the alignment volume of the pair [ every ] coil has been carried out to the part corresponding to 2 pieces of the outside of the 3 pieces of this core.

[Claim 4] Said core is a common mode choke transformer given in claim 1 thru/or any of 3 they are. [ which is supported so that the end of a core may counter a substrate and a gap may be generated between a core and a substrate in the substrate made from an insulating material ]

[Claim 5] The common mode choke transformer according to claim 4 by which notching is prepared in the substrate part which counters the foot to which the alignment volume of the coil of said core has been carried out.

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[Translation done.]

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the common mode choke transformer from which the common mode noise produced when transmitting a signal among electronic equipment, such as a personal computer and a digital video camera, is removed.

[0002]

[Description of the Prior Art] Drawing 12 is the top view showing the conventional common mode choke transformer, and 25 are a toroidal doughnut-like core among drawing. In the toroidal core 25, they are coil 28a of a primary side and a secondary, and 28b. It has wound in the predetermined pitch and this toroidal core 25 is fixed with the aspect to which the opening 26 of the toroidal core 25 counters the base 21 made from an insulating material at the base 21. Four terminals 22, 22, 23, and 23 are attached in the base 21, and they are both coil 28a and 28b to each terminals 22, 22, 23, and 23. Both ends are connected to each \*\*.

[0003] Coil 28a of the primary side wound around this toroidal core 25 by such common mode choke transformer at the toroidal core 25 list, and a secondary, and 28b One transformer is constituted. Coil 28a of this primary side and a secondary, and 28b Since it is high association, since it functions as a coil to the common mode noise which is the noise current which flows between a signal line and earth grounds, its impedance is high, and since electromagnetic association hardly functions on the current of the normal mode which flows between signal lines as a coil, an impedance is low [ association / it is dense, and ]. Therefore, coil 28a by the side of primary And coil 28b of a secondary About the circuit of

one channel considered as I/O, common mode noise is efficiently removable.

[0004] On the other hand, the circuit of two channels is established in the interface module corresponding to IEEE1394 that differential transmission of the signal should be carried out. In order to remove the common mode noise produced in such a circuit of two channels, the following common mode choke transformers are indicated by JP,11-135330,A.

[0005] Drawing 13 and drawing 14 are the front views and top views of a common mode choke transformer which were indicated by JP,11-135330,A, and 31 are the base which made the insulating material the shape of a rectangle among drawing. The terminals 32, 32, 32, 32, 33, 33, 33, and 33 of a total of eight shape of every four rectangle separate predetermined spacing in the both-sides side by the side of the long side of the base 31 to the longitudinal direction of a long side, and it has protruded on it, respectively, and each terminals 32, 32, 32, 32, 33, 33, 33, and 33 are bent stair-like so that a point may become flat-tapped with the rear face of the base 31.

[0006] The glasses mold core 37 which established the cylinder-like through tubes 38 and 38 near the two poles of an elliptic cylinder in the center of a front face of the base 31, respectively is fixed to the base 31 with the aspect which made the peripheral surface flat part of this glasses mold core 37 contact the base 31. the part between one polar zone of the glasses mold core 37, and one through tube 38 -- 1st coil 41a of the primary pair [ secondary ], and 41b The alignment volume has been carried out so that it may become the predetermined number of turns, and the 1st transformer is formed by this. Both 1st coil 41a and 41b It is made to have wound around the terminals 32 and 32 of the pair which protruded on one side face of the base 31, and a close side edge is both 1st coil 41a and 41b. The appearance side edge is made to have wound around the terminals 33 and 33 of the pair which protruded on the other side faces of the base 31.

[0007] moreover, the part between the other polar zones of the glasses mold core 37, and the through tube 38 of another side -- primary coil [ secondary /

2nd ] of other pairs 42a, and 42b The alignment volume has been carried out so that it may become the predetermined number of turns, and the 2nd transformer is formed by this. Both 2nd coil 42a and 42b It is made to have wound around the terminals 32 and 32 of other pairs which protruded on one side face of the base 31, and a close side edge is both 2nd coil 42a and 42b. The appearance side edge is made to have wound around the terminals 33 and 33 of other pairs which protruded on the other side faces of the base 31.

[0008] By such common mode choke transformer, the common mode noise produced in the circuit of two channels, respectively is removable to each \*\* by the 1st transformer and 2nd transformer which were mentioned above.

[0009]

[Problem(s) to be Solved by the Invention] By the way, what was more excellent in the RF property is demanded of these common mode choke transformers as the clock frequency of the electronic equipment in which it is made to carry becomes high. However, by any conventional common mode choke transformer, it wound with the location of the cut water to the core of the coil of a pair, and since the location of an end was comparatively near, stray capacity was large and there was a limitation in raising a RF property. Moreover, the winding pitch to the core of a coil is small as it goes to an inner circumference edge from the periphery edge of a core, and that stray capacity is also as large as the part of the inner circumference veranda of the core of a coil has become the cause which bars improvement in a RF property.

[0010] It is in offering the common mode choke transformer which reduces stray capacity further and has a higher high frequency property by making this invention in view of this situation, and carrying out the place made into the purpose to the configuration in which the edge of a tubed core wound around the part of a straight-line configuration the coil which makes a pair, without enlarging size.

[0011]

[Means for Solving the Problem] In the common mode choke transformer around

which the coil with which the common mode choke transformer concerning the 1st invention makes the pair of a primary side and a secondary to a tubed core is wound with the aspect which penetrates this incore one, the part around which said coil of the edge of said core is wound is characterized by having a straight-line configuration.

[0012] In the 1st invention, said core is a 2-piece mold and the common mode choke transformer concerning the 2nd invention is characterized by having carried out the alignment volume of the coil of a pair to the part corresponding to one foot of this core.

[0013] In the 1st invention, said core is a 3-piece mold and the common mode choke transformer concerning the 3rd invention is characterized by having carried out the alignment volume of the pair [ every ] coil to the part corresponding to 2 pieces of the outside of the 3 pieces of this core.

[0014] The tubed core which has the part of a straight-line configuration is prepared. As such a core, there is a core of a 2-piece mold or a core of a 3-piece mold. The alignment volume of the coil of the pair of a primary side and a secondary has been carried out to the part of the straight-line configuration of these cores. That is, with the core of a 2-piece mold, the alignment volume of the coil of a pair has been carried out to 1 piece of this core, and the common mode noise produced in the circuit of one channel with both coils is removed. Moreover, with the core of a 3-piece mold, the alignment volume of the pair [ every ] coil has been carried out to 2 pieces of the outside of the 3 pieces, and the common mode noise produced in the circuit of two channels with two pairs of coils is removed to each \*\*.

[0015] Thus, since the alignment volume of the coil which makes a pair has been carried out to the part of the straight-line configuration of a core, it wound with the location of the cut water of the coil to a core, and is mutually separated from the last location, and the winding pitch to the core of a coil can be made abbreviation regularity over the whole set time field of a coil. Since stray capacity is reduced by this, the RF property of a common mode choke transformer is high.



[0016] The common mode choke transformer concerning the 4th invention is set they to be [ any of the 1st thru/or the 3rd invention ], and said core is characterized by being supported so that the end of a core may counter a substrate at the substrate made from an insulating material and a gap may be generated between a core and a substrate.

[0017] The core is arranged so that an end may counter a substrate (base). And in order to secure the tooth space of the coil wound so that it may penetrate incore, the gap is prepared between the core and the substrate by preparing heights in a substrate or a core. Adhesion between the core substrates which avoided contact to a coil and a substrate and were stabilized by this is attained. Furthermore, the back quantity of a common mode choke transformer can also be made low as much as possible. Moreover, since a coil can also be wound around a core where a core is supported to a substrate, the core which is not winding the coil is fixable to a substrate first. This can perform immobilization to the substrate of a core easily. Moreover, where a core is supported to a substrate, when a coil is wound around a core, since immobilization of the both ends of a coil is easy, this activity can be done quickly.

[0018] The common mode choke transformer concerning the 5th invention is characterized by having prepared notching in the substrate part which counters the foot to which the alignment volume of the coil of said core has been carried out in the 4th invention.

[0019] Since [ of a substrate ] notching is suitably prepared in the part, after fixing a core to a substrate, the activity which carries out the alignment volume of the coil to the foot of a core can be done easily, without being interfered by the substrate.

[0020]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is concretely explained based on a drawing.

(Gestalt 1 of operation) Drawing 1 , drawing 2 , and drawing 3 are the front views, top views, and side elevations showing the common mode choke transformer

concerning this invention, and drawing 4 is the representative circuit schematic of the common mode choke transformer shown in drawing 1 - drawing 3 . Two close side edge children 2 and 2 of a crank configuration have protruded at one side face of the base 1 which comes to fabricate an insulating material in a square configuration, it is parallel to said one side face of the base 1, and also two appearance side edge children 3 and 3 of a crank configuration have protruded on the side face. The base of the point of these close side edge children 2 and 2 and the appearance side edge children 3 and 3 is used as the rear face of the base 1 at abbreviation flush, respectively.

[0021] The neck ring core 5 of 2 pieces which fabricated the soft magnetic materials of a NiZn system to Nogata tubed is fixed in the center of a front face of the base 1 with the aspect which made the peripheral surface by the side of the merits side contact the base 1. It is not in contact with the base 1 of the neck ring core 5, and also they are two coil 11a and 11b to the part between the long side side edge section and opening 6. The alignment volume has been carried out in the winding pitch of abbreviation regularity to the longitudinal direction of the long side of the neck ring core 5. Both coil 11a and 11b Winding immobilization has been carried out at each \*\* at one pair of close side edge children 2 and 2 who protruded on one side face of the base 1, and an end is both coil 11a and 11b. Winding immobilization of the other end has been carried out at each \*\* at one pair of appearance side edge children 3 and 3 who protruded on the other side faces of the base 1. Of this, as shown in drawing 4 , Transformer T is formed between the close side edge children 2 and 2 and the appearance side edge children 3 and 3.

[0022] By such common mode choke transformer, the common mode noise produced in the circuit of one channel by Transformer T is removed. this time -- both coil 11a and 11b since it has wound as mentioned above to the neck ring core 5 -- the long dimension of opening 6, and abbreviation -- compared with the case where the alignment volume of the two coils is carried out, it wound around the toroidal core of the same diameter with the location of the cut water of both

the coils to a core, and is mutually separated from the location of an end.

Moreover, both coil 11a and 11b The winding pitch to the neck ring core 5 is abbreviation regularity over all the fields of the longitudinal direction of the long side of the neck ring core 5. Since stray capacity is reduced by this, by it, the RF property of a common mode choke transformer can be raised.

[0023] (Gestalt 2 of operation) Drawing 5 , drawing 6 , and drawing 7 are the front views, top views, and side elevations showing the common mode choke transformer concerning the gestalt 2 of operation, and are made as [ respond / it / to the circuit of two channels ]. Moreover, drawing 8 is the representative circuit schematic of the common mode choke transformer shown in drawing 5 - drawing 7 . On the rectangle-like base 1, it penetrates in the height direction in a low back rectangular parallelepiped, and the Japan Wood Pattern Manufacturers Association core 7 of 3 pieces to which the rectangle-like two through tubes 8 and 8 are established for plane view to a long side and parallel is arranged. Two or more heights 4 and 4 of height and -- are suitably prepared at proper spacing, and by these heights 4 and 4 and --, from the base 1, into the part which counters a part for the short side part of the Japan Wood Pattern Manufacturers Association core 7 of the base 1, the Japan Wood Pattern Manufacturers Association core 7 separates a proper distance, and is supported.

[0024] Four close side edge children 2, 2, 2, and 2 of a crank configuration have protruded on one side face by the side of the shorter side of the base 1, and four appearance side edge children 3, 3, 3, and 3 of a crank configuration have protruded on the other side faces by the side of the shorter side of the base 1. The base for a point of these close side edge children 2, 2, 2, and 2 and the appearance side edge children 3, 3, 3, and 3 is made into the rear face and abbreviation flush of the base 1.

[0025] the part between the through tubes 8 and 8 of the Japan Wood Pattern Manufacturers Association core 7, and the long side side edge section (outside foot) -- 2 pairs of coil 11a, 11b, 12a, and 12b the longitudinal direction of the long side of the Japan Wood Pattern Manufacturers Association core 7 -- abbreviation

-- the alignment volume has been carried out in the fixed winding pitch. Coil 11a of a pair, and 11b Winding immobilization has been carried out at each \*\* at the close side edge children 2 and 2 of a pair, and an end is both coil 11a and 11b. Winding immobilization of the other end has been carried out at each \*\* at the appearance side edge children 3 and 3 of a pair. Moreover, coil 12a of other pairs and 12b Winding immobilization has been carried out at each \*\* at the close side edge children 2 and 2 of other pairs, and an end is both coil 12a and 12b. Winding immobilization of the other end has been carried out at each \*\* at the appearance side edge children 3 and 3 of other pairs. As this showed to drawing 8 , it is a transformer T1 between the close side edge children 2 and 2 of a pair, and the appearance side edge children 3 and 3. It is formed and is a transformer T2 between the close side edge children 2 and 2 of other pairs, and the appearance side edge children 3 and 3. It is formed.

[0026] With such a common mode choke transformer, it is a transformer T1 and T2. The common mode noise produced in the circuit of two channels is removed. this time -- 2 pairs of coil 11a, 11b, 12a, and 12b since it has wound as mentioned above to the Japan Wood Pattern Manufacturers Association core 7 -- the outer slope of the Japan Wood Pattern Manufacturers Association core 7, and abbreviation -- compared with the case where the alignment volume of two pairs of coils is carried out, it wound around the glasses mold core of the same outer slope with the location of the cut water of the coil of both pairs to a core, and is mutually separated from the location of an end. Moreover, coil 11a of both pairs, 11b, 12a, and 12b The winding pitch to the Japan Wood Pattern Manufacturers Association core 7 is abbreviation regularity over all the fields of the longitudinal direction of the long side of the Japan Wood Pattern Manufacturers Association core 7. Since stray capacity is reduced by this, by it, the RF property of a common mode choke transformer can be raised.

[0027] In addition, although the Japan Wood Pattern Manufacturers Association core 7 is supported by two or more heights 4 and 4 and -- with the gestalt of this operation, it cannot be overemphasized that this invention may use the Japan

Wood Pattern Manufacturers Association core which prepared two or more legs of height suitably for the part which counters the base 1 not only this but by the side of a shorter side.

[0028] In addition, with the gestalt 1 of operation, although the neck ring core 5 is fixed to the base 1 with the aspect which made the merits side side peripheral surface of the neck ring core 5 contact the base 1, this invention may be arranged so that the opening 6 of not only this but the neck ring core 5 may counter the base. in this case, the thing for which heights are prepared in the base 1 -- or a necessary gap is prepared between the neck ring core 5 and the base 1 by preparing the leg in the open end of the neck ring core 5.

[0029] (Gestalt 3 of operation) Drawing 9 is the perspective view showing the common mode choke transformer concerning the gestalt 3 of operation, and drawing 10 is the perspective view of the base 1 shown in drawing 9 . With the gestalt of this operation, except that the configurations of the base 1 differ, it is the same configuration as substantially as the common mode choke transformer shown in the gestalt 2 of operation, and among drawing 9 and drawing 10, the same number is given to the part corresponding to the part shown in drawing 5 - drawing 7 , and the explanation is omitted.

[0030] the base 1 -- the center line top to the longitudinal direction of a rectangular plate -- the width of face of the central foot of the Japan Wood Pattern Manufacturers Association core 7, and abbreviation -- the 1st heights 17 of the same width of face are formed, and four corners 15, 15, 15, and 15 are formed by forming the notching 16 and 16 of the rectangle which reaches in the center of both edges by the side of a long side at the 1st heights 17, respectively. The 2nd heights 18 and 18 of the same height as said 1st heights 17 are formed in the corner of two corners 15 and 15 located on one diagonal line of these four corners 15, 15, 15, and 15, respectively.

[0031] Coil 11a of 2 pairs [ foot / of the outside of the Japan Wood Pattern Manufacturers Association core 7 ], 11b, 12a, and 12b after carrying out adhesion immobilization of 2 of four corners of the Japan Wood Pattern

Manufacturers Association core 7, and the 2nd heights 18 and 18 of the base 1, respectively while carrying out adhesion immobilization of the central foot of the Japan Wood Pattern Manufacturers Association core 7, and the 1st heights 17 of the base 1 if it is in such a common mode choke transformer An alignment volume is carried out, respectively. Since notching 16 and 16 is formed in the base 1 at this time as mentioned above, they are coil 11a, 11b, and 12a and 12b. The winding activity to the Japan Wood Pattern Manufacturers Association core 7 can be done easily, without being interrupted by the base 1, and winding working efficiency is high. Moreover, coil 11a, 11b, 12a, and 12b Since adhesion immobilization of the Japan Wood Pattern Manufacturers Association core 7 which is not wound is carried out at the base 1, this immobilization can be performed easily.

[0032] Furthermore, if it is in the corner 15 in which the 2nd heights 18 are formed Although the edge of a coil must be made to insert in in this corner 15, the 2nd heights 18, the Japan Wood Pattern Manufacturers Association core 7, and the part of the shape of a tunnel surrounded by the 1st heights 17 Since the 2nd heights 18 and 18 are not formed in two corners 15 and 15 located on the diagonal line of another side of the four corners 15, 15, 15, and 15, the part of the shape of a tunnel mentioned above does not exist, but the activity in which a coil is made to insert is avoided. Therefore, coil 11a, 11b, 12a, and 12b The activity which carries out winding immobilization to the close side edge children 2 and 2 or the appearance side edge children 3 and 3 can be done easily.

[0033] In addition, although the gestalt of this operation showed the case where the 2nd heights 18 and 18 were formed in two corners 15 and 15 of the base 1, it cannot be overemphasized that this invention may use the base 1 which has prepared the 2nd heights not only in this but in neither of the corners, 15, 15, 15, nor 15.

[0034] Moreover, although the gestalt of this operation has shown the case where the Japan Wood Pattern Manufacturers Association core 7 is used, this invention may use not only this but the neck ring core 5. In this case, by

arranging so that the opening 6 of the neck ring core 5 may counter the base, and preparing heights in the base 1 Or while the neck ring core 5 is fixed to the base 1 so that a necessary gap may be formed between the neck ring core 5 and the base 1 by preparing the leg in the open end of the neck ring core 5, notching is prepared in the part which counters one [ of the base 1 ] foot of the neck ring core 5. this -- front -- one foot of the neck ring core 5 after fixing the neck ring core 5 to the base 1 similarly -- coil 11a and 11b It can wind easily.

[0035]

[Example] Next, the result of having performed the comparative study is explained. Drawing 11 is a graph which shows the result of having performed the comparative study, an axis of ordinate shows an impedance and the axis of abscissa shows the frequency, respectively. Moreover, the continuous line shows the frequency characteristics of the common mode choke transformer concerning the gestalt 2 of operation, and - mark shows the frequency characteristics of the conventional common mode choke transformer using the glasses mold core shown in drawing 13 and drawing 14. In addition, the outer slope of the core of both the common mode choke transformer is the same. Compared with the conventional common mode choke transformer, in all the fields of the examined frequency, the common mode choke transformer concerning this invention had the high impedance, and its peak frequency of an impedance was also high so that clearly from drawing 11.

[0036]

[Effect of the Invention] If it is in the common mode choke transformer concerning the 1st, 2nd, and 3rd invention as explained in full detail above, since it wound with the location of the cut water of the coil to a core, and is mutually separated from the last location and the winding pitch to the core of a coil can be made abbreviation regularity over the whole set time field of a coil, stray capacity is small and the RF property of a common mode choke transformer is high.

[0037] If it is in the common mode choke transformer concerning the 4th invention, adhesion between the core substrates which avoided contact to a coil

and a substrate and were stabilized is attained. Furthermore, the back quantity of a common mode choke transformer can also be made low as much as possible. Moreover, while being able to perform immobilization to the substrate of a core easily, since immobilization of the both ends of a coil is easy, this activity can be done quickly.

[0038] If it is in the common mode choke transformer concerning the 5th invention, after fixing a core to a substrate, this invention does the outstanding effectiveness so -- the activity which carries out the alignment volume of the coil to the foot of a core can be done easily, without being interrupted by the substrate.

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[Translation done.]

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the front view showing the common mode choke transformer concerning this invention.

[Drawing 2] It is the top view showing the common mode choke transformer concerning this invention.

[Drawing 3] It is the side elevation showing the common mode choke transformer



concerning this invention.

[Drawing 4] It is the representative circuit schematic of the common mode choke transformer shown in drawing 1 - drawing 3 .

[Drawing 5] It is the front view showing the common mode choke transformer concerning the gestalt 2 of operation.

[Drawing 6] It is the top view showing the common mode choke transformer concerning the gestalt 2 of operation.

[Drawing 7] It is the side elevation showing the common mode choke transformer concerning the gestalt 2 of operation.

[Drawing 8] It is the representative circuit schematic of the common mode choke transformer shown in drawing 5 - drawing 7 .

[Drawing 9] It is the perspective view showing the common mode choke transformer concerning the gestalt 3 of operation.

[Drawing 10] It is the perspective view of the base shown in drawing 9 .

[Drawing 11] It is the graph which shows the result of having performed the comparative study.

[Drawing 12] It is the top view showing the conventional common mode choke transformer.

[Drawing 13] It is the front view of the common mode choke transformer indicated by JP,11-135330,A.

[Drawing 14] It is the top view of the common mode choke transformer indicated by JP,11-135330,A.

[Description of Notations]

1 Base

2 Close Side Edge Child

3 Appearance Side Edge Child

4 Heights

5 Neck Ring Core

6 Opening

7 Japan Wood Pattern Manufacturers Association Core

8 Through Tube

11a Coil

11b Coil

12a Coil

12b Coil

16 Notching

17 1st Heights

18 2nd Heights

T Transformer

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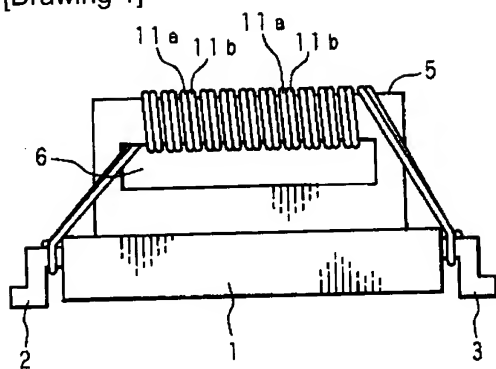
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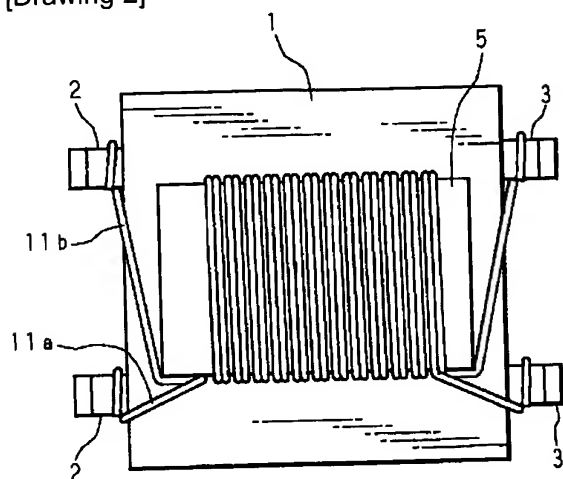
DRAWINGS

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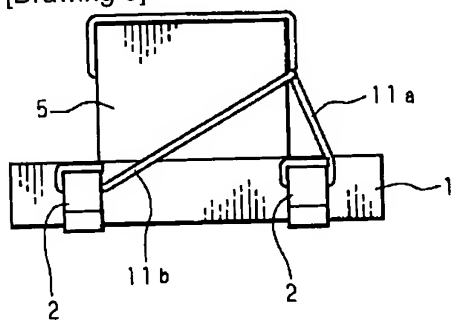
[Drawing 1]



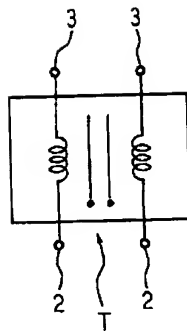
[Drawing 2]



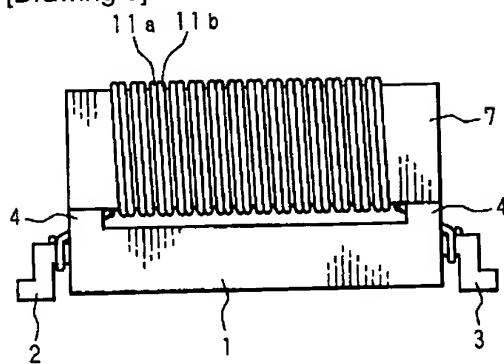
[Drawing 3]



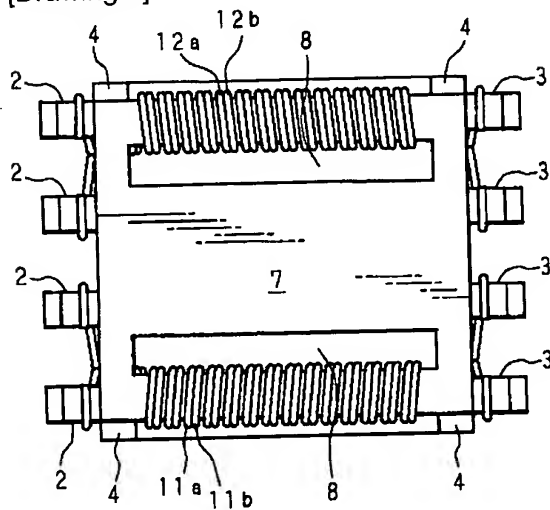
[Drawing 4]



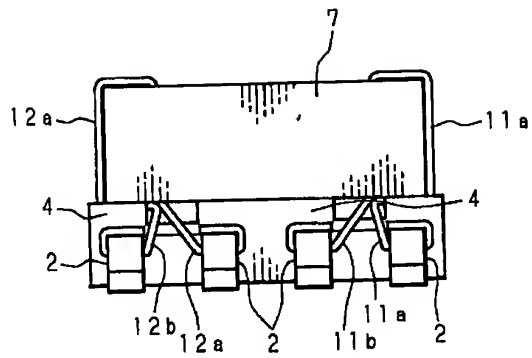
[Drawing 5]



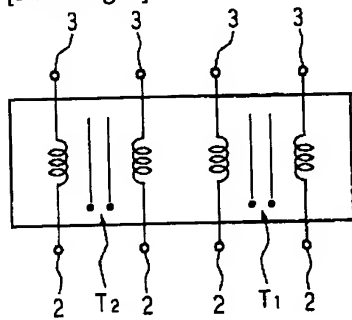
[Drawing 6]



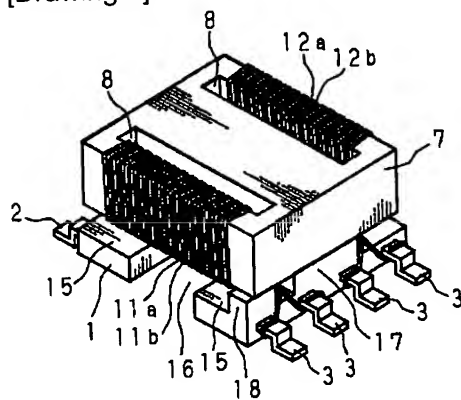
[Drawing 7]



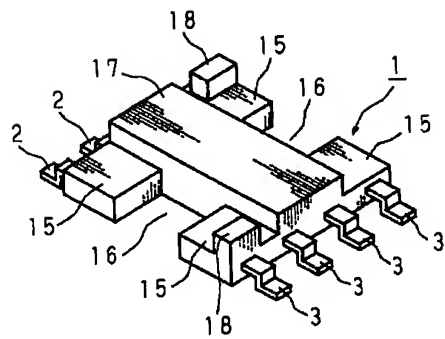
[Drawing 8]



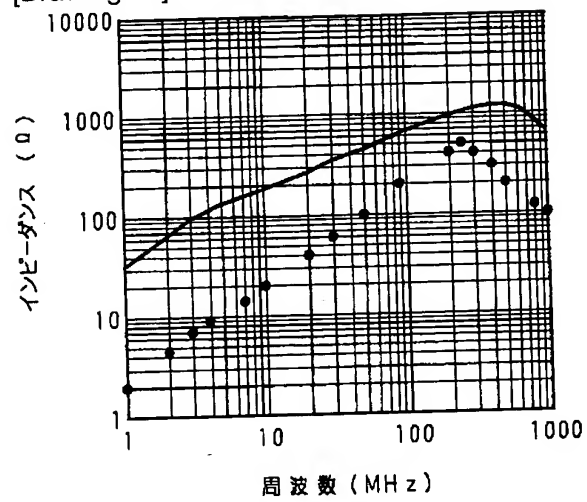
[Drawing 9]



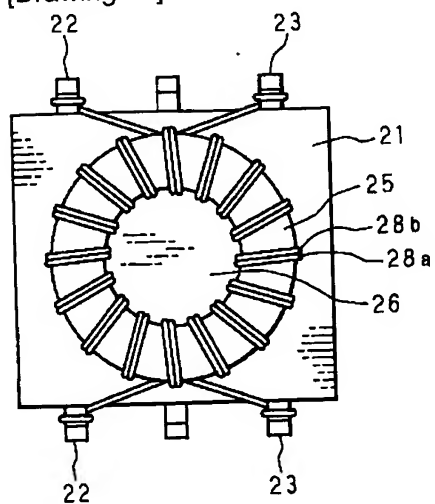
[Drawing 10]



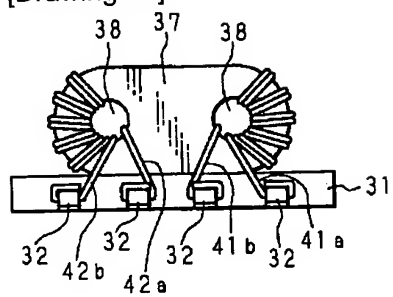
[Drawing 11]



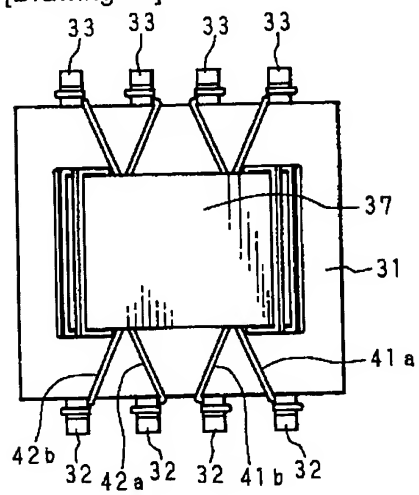
[Drawing 12]



[Drawing 13]



[Drawing 14]




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[Translation done.]